

وسهلا



أهلا

يُمنع أخذ السلايدات بدون
إذن المحرر واي اجراء
يخالف ذلك يقع تحت طائلة
المسؤولية القانونية
جميع المعلومات للاستخدام
التعليمي فقط

الأستاذ الدكتور يوسف حسين

رئيس قسم التشريح والأنسجة والأجنة

كلية الطب - جامعة مؤتة - الأردن

دكتورة من جامعة كولونيا المانيا

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➤ **Folding of Embryo**

<https://www.youtube.com/@ProfDrYoussefHusseainAnatomy/playlists>

- **Folding of the embryo**
- **begins during 3rd week and completed at 4th week**



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** Causes of folding:

1. The most common cause is growth and development of the **somites**.
2. Rapid increase in the amount of **amniotic fluid** around the embryo.
3. Rapid growth of the cranial part of the **neural tube** than its caudal part.
4. Unequal rate of growth and development of the **internal organs**.

Types of folding

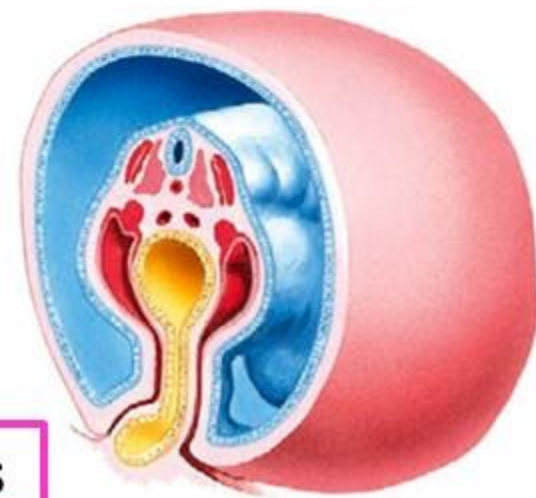
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Craniocaudal folding

- **Head fold**, cranial part of the embryo bends ventral to the cranial end of the notochord.
- **Tail fold**, caudal part of the embryo bends ventral to the caudal end of the notochord.

Lateral folding

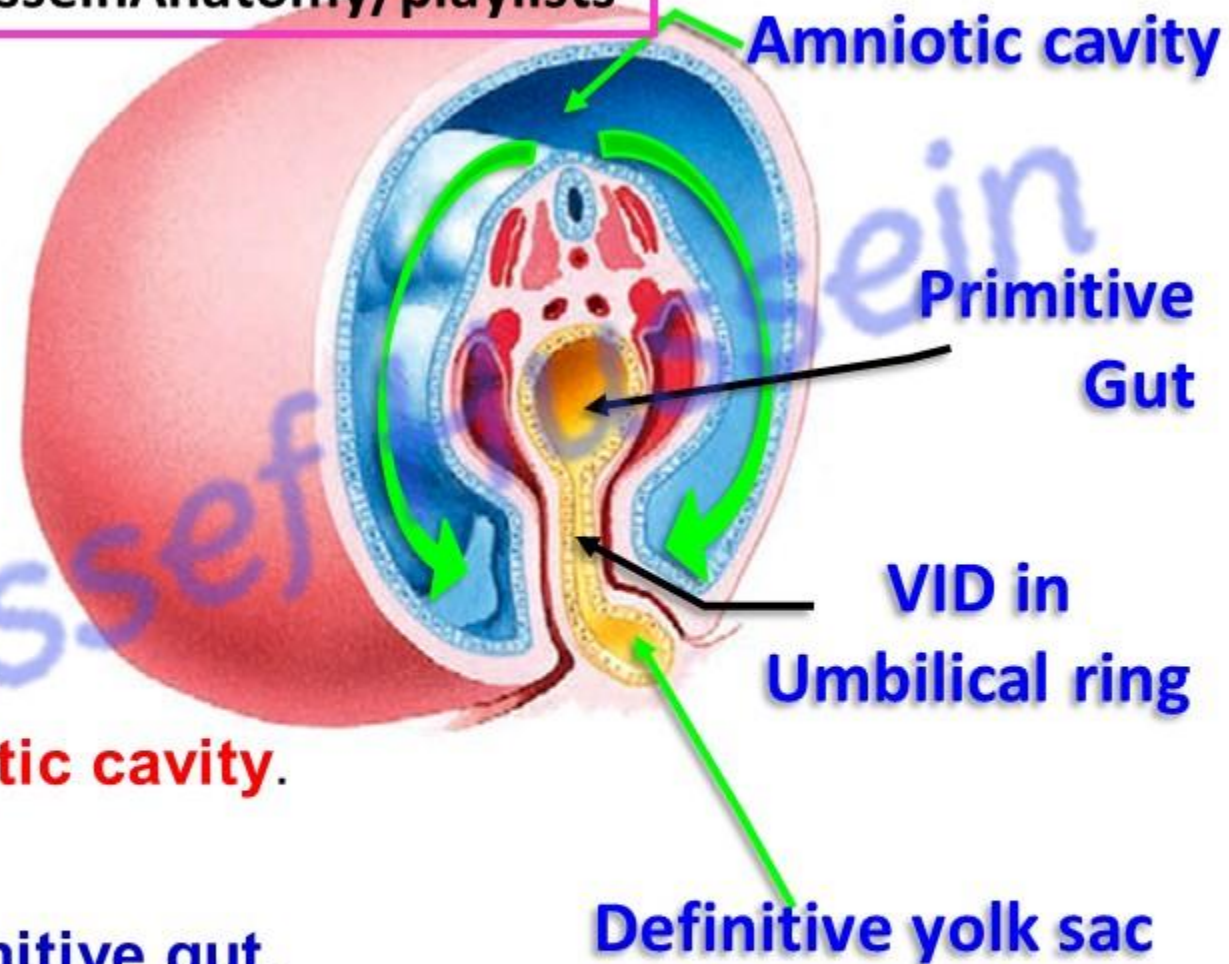
- **Right and left Lateral folding**: The margins of the embryo bend ventrally.



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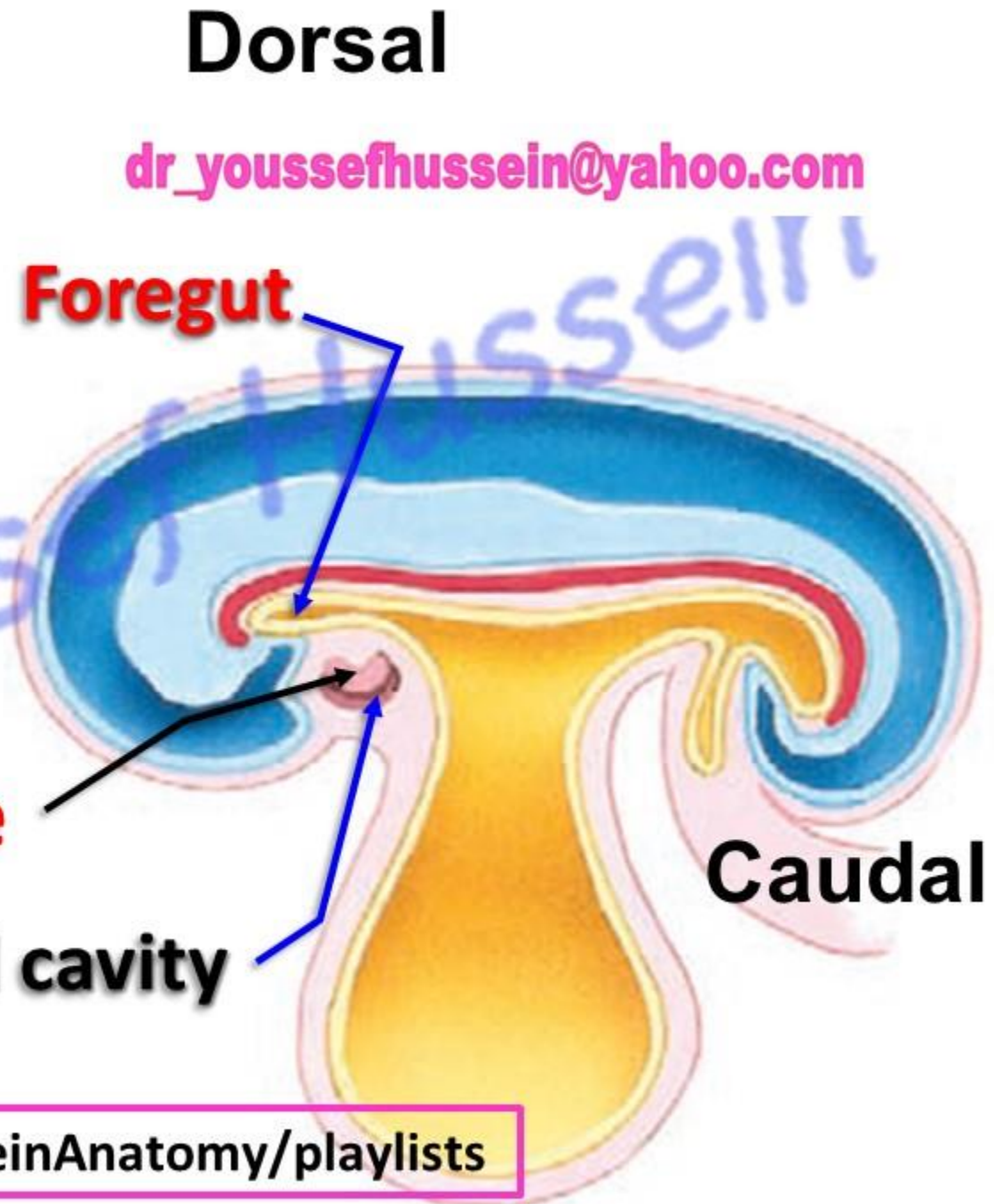
** Results of the folding

- The embryo becomes cylindrical in shape.
- The embryo is **surrounded by the amniotic cavity**.
- **The 2ry yolk sac** divides into:
 - a- Part inside the embryo forming the **primitive gut**.
 - b- Part remains outside the body called the **definitive yolk sac**.
- The 2 parts are connected at the **umbilical ring** by vitellointestinal duct (V.I.D).
- **The point of meeting** of the folds is the umbilical ring.



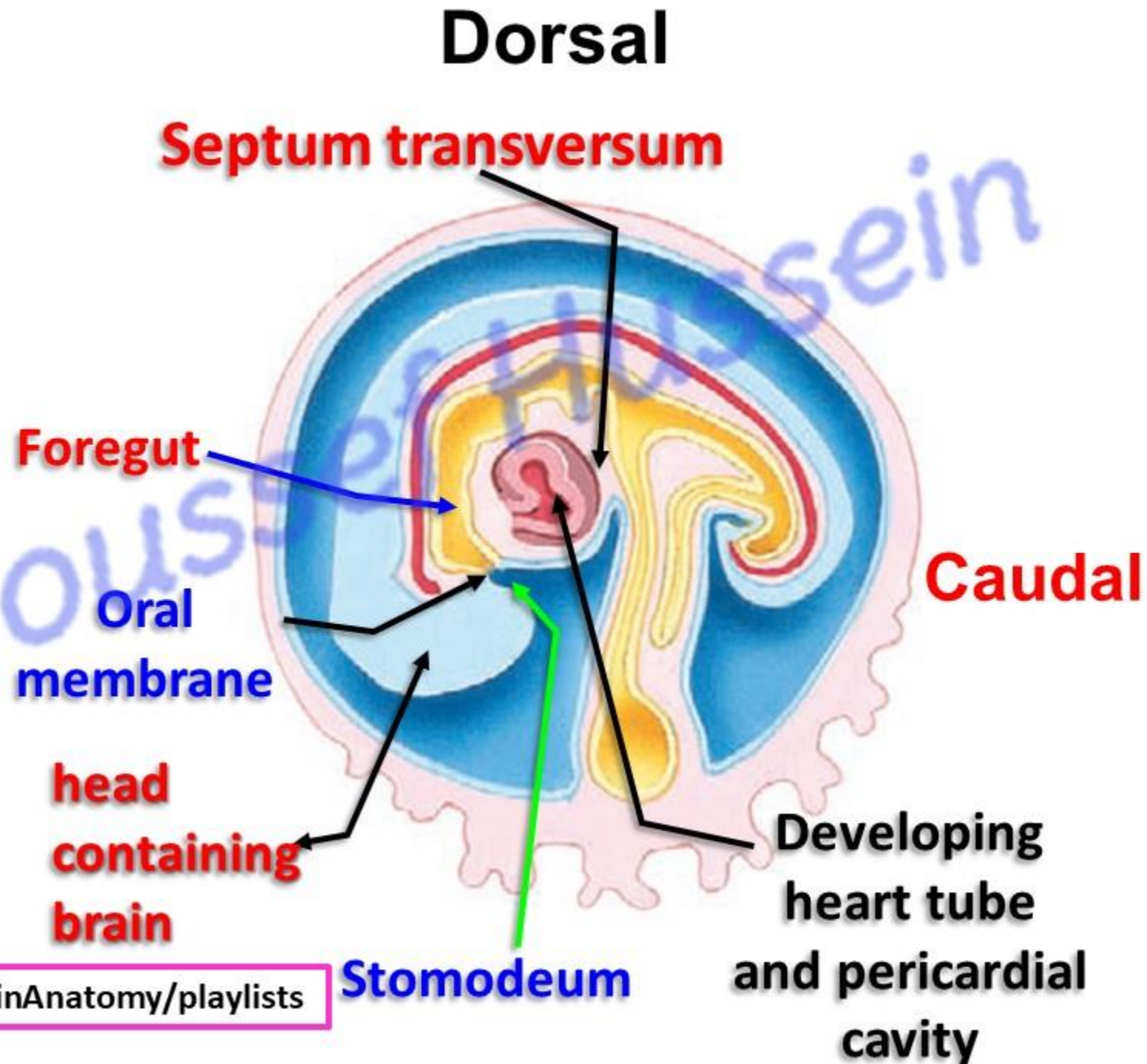
➤ Results of head Folding

- The part of the gut is called foregut
- The heart tube lies ventral to foregut and dorsal to the pericardial cavity



➤ Results of head Folding

- The **septum transversum** lies **caudal** to the heart tube and pericardial cavity
- The **oral membrane** and **Stomodeum** (Primitive mouth cavity) **ventral** to the Heart tube & pericardial cavity
- The **head containing forebrain** become the most **ventral and cranial** part of the embryo.



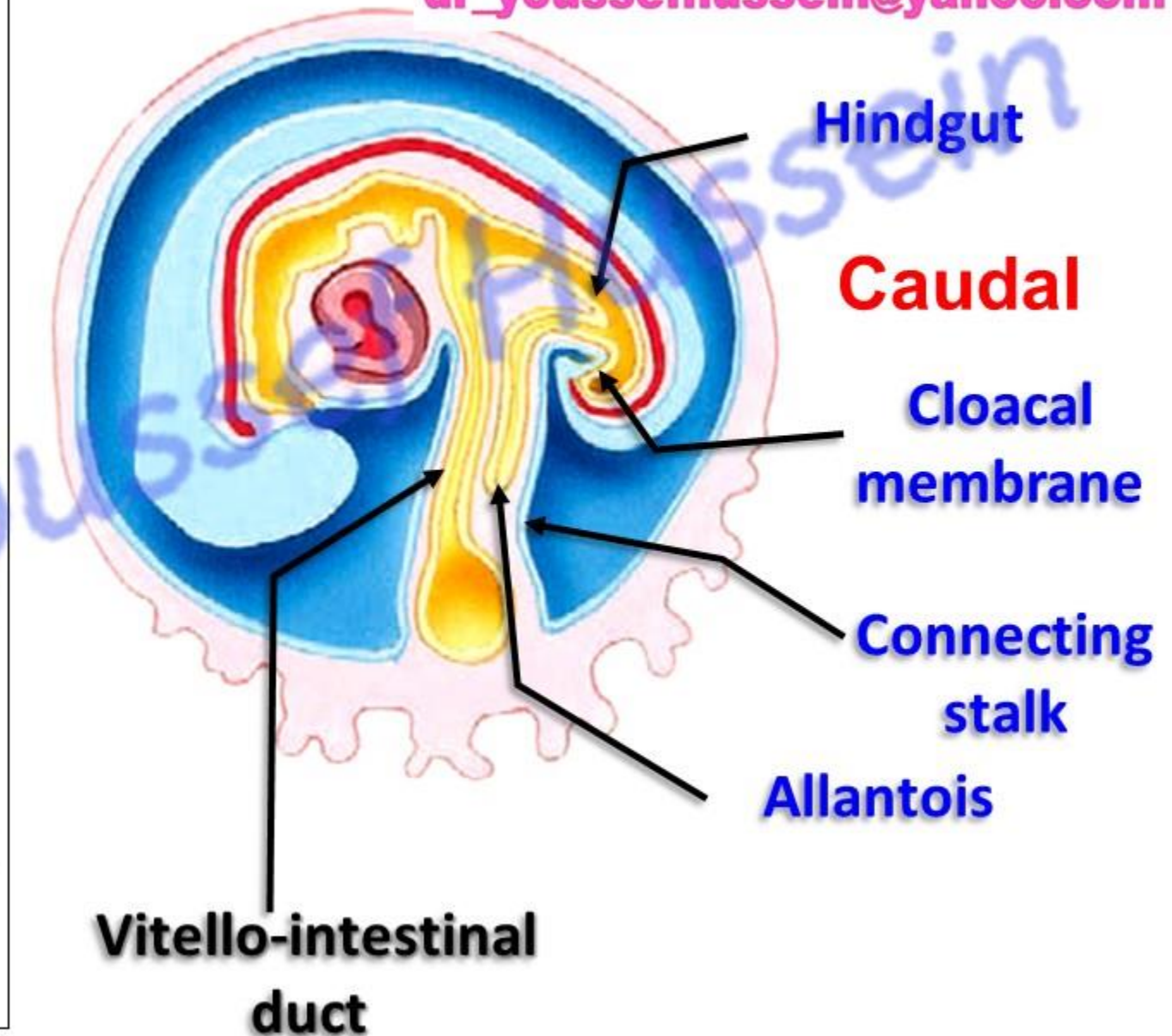
➤ Results of tail Folding

- The part of the gut is called hindgut and its terminal dilated part called **Cloaca**
- The **cloacal membrane** ventral to caudal end of embryo and caudal to **allantois**
- The connecting stalk (**Future umbilical cord**) ventral to embryo and containing **allantois** (small diverticulum develops from caudal part of **hindgut**) and **vitellointestinal duct**

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Dorsal

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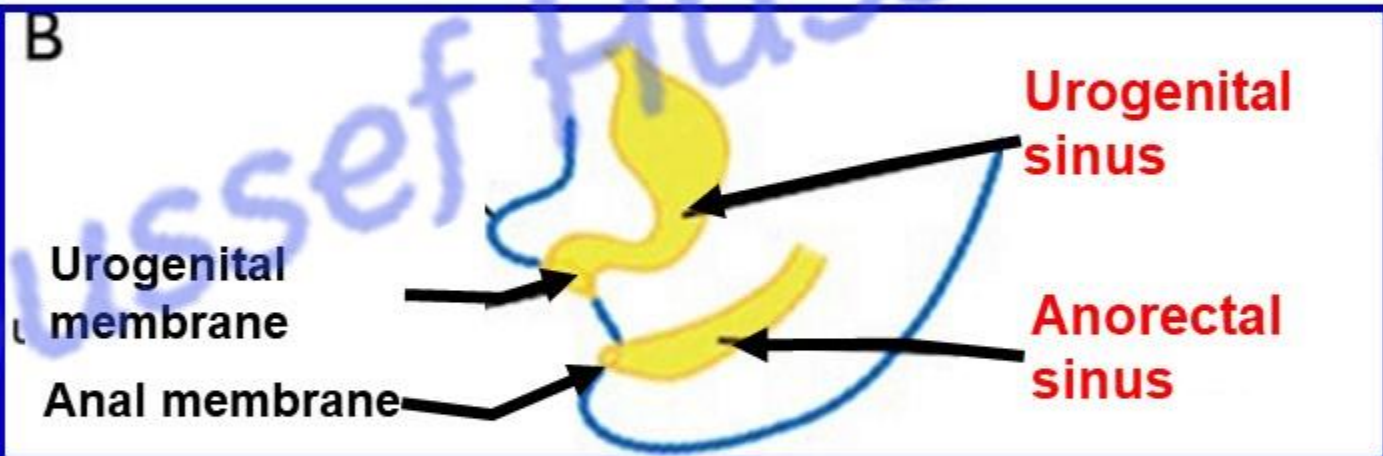
❖ Derivatives of cloaca

- The cloaca is the caudal dilated part of the **hindgut**, which is closed by the cloacal membrane and connected to umbilicus by **allantois (urachus)**.

- It is divided by **Urorectal septum** into:

1- **Ventral part** called **urogenital sinus**, closed by urogenital membrane that forms the mucosa of the urinary bladder and urethra (and the lower part of the vagina in females).

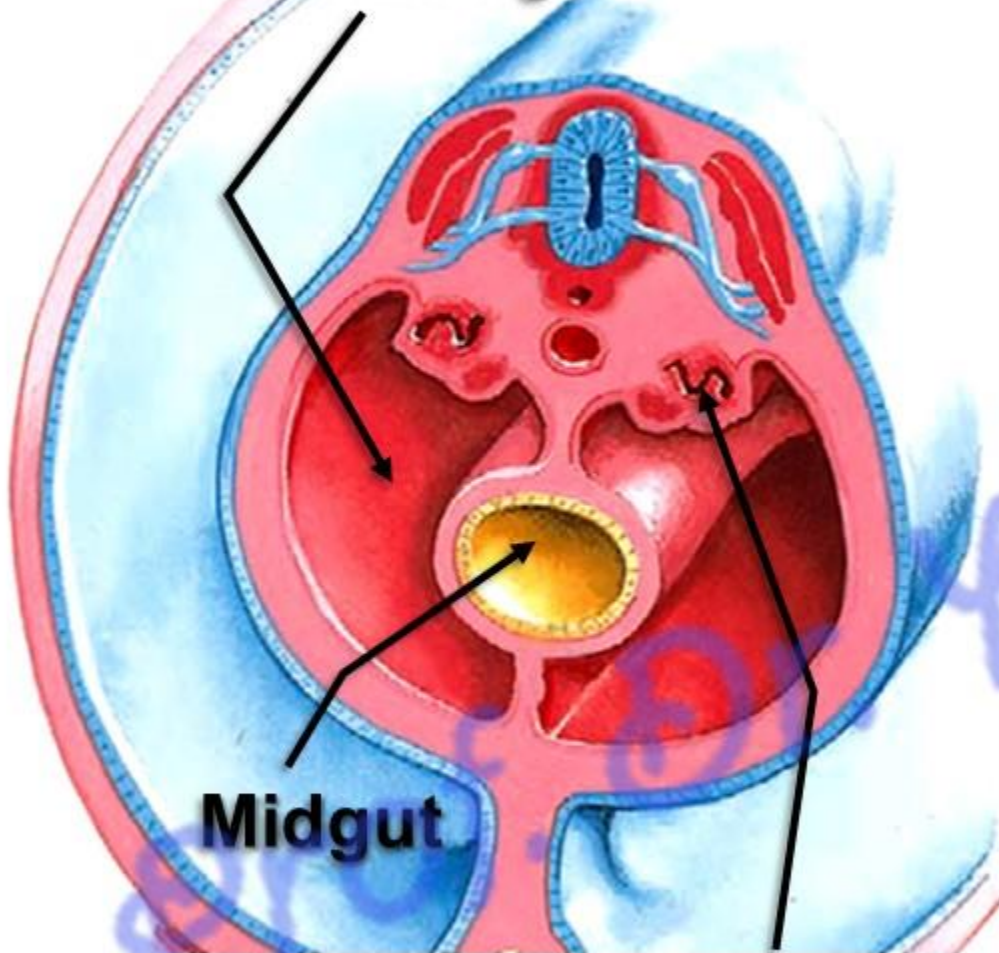
2- **Dorsal part** called **anorectal sinus**, closed by **anal membrane**. forms the mucosa of the rectum and upper part of the anal canal.



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Single peritoneal cavity



Intermediate
mesoderm

➤ Results of lateral Folding

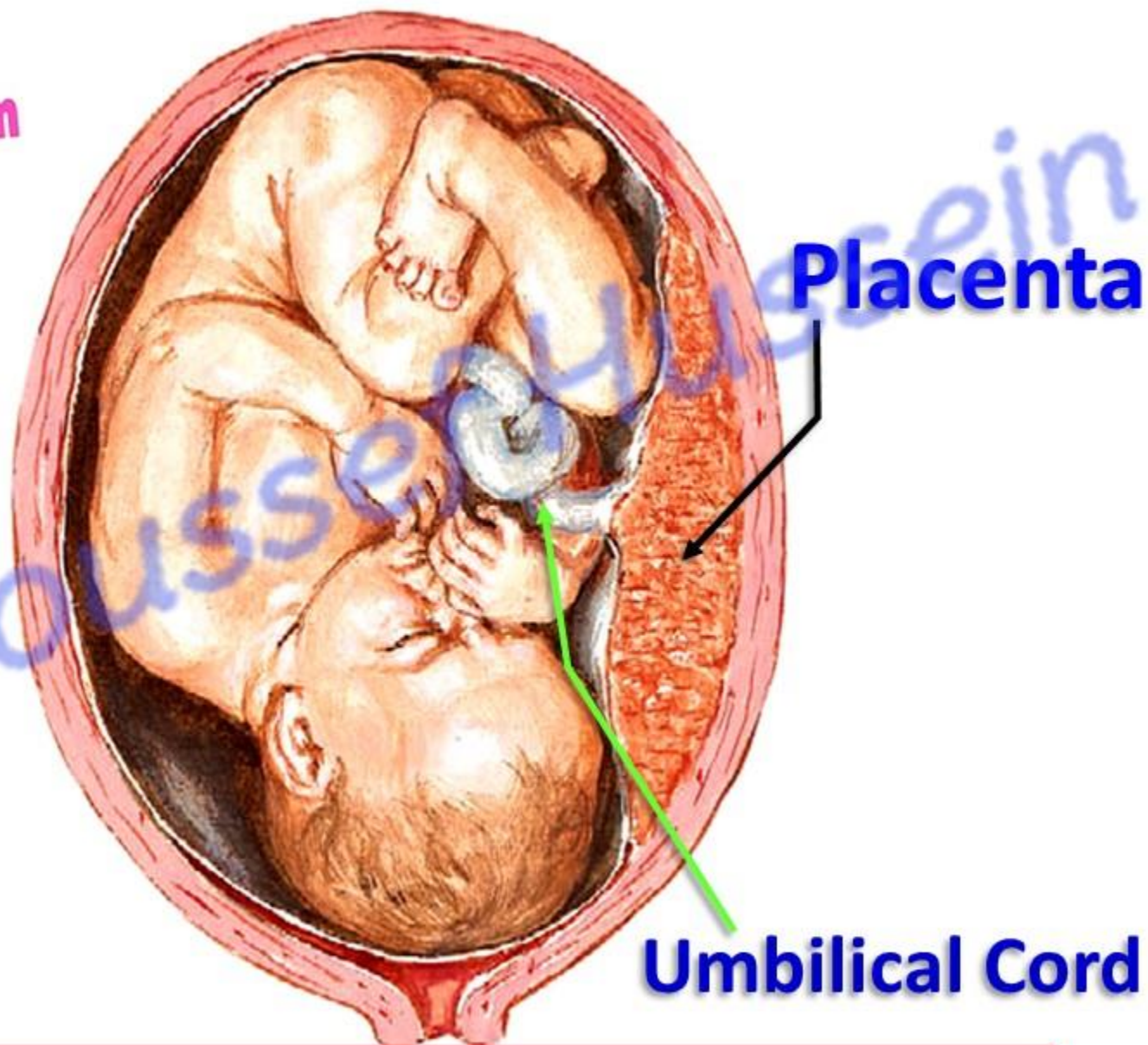
- The embryo becomes **cylindrical** in shape.
- The part of the gut is called **midgut** and connecting to the dorsal wall of the embryo by **dorsal mesentery**
- **Vitello-intestinal duct between midgut and definitive yolk sac**
- The caudal parts of the intraembryonic coelom fuse together to form **a single peritoneal cavity.**
- The **intermediate mesoderm** becomes dorsal to the peritoneal cavity.

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Development of Umbilical Cord

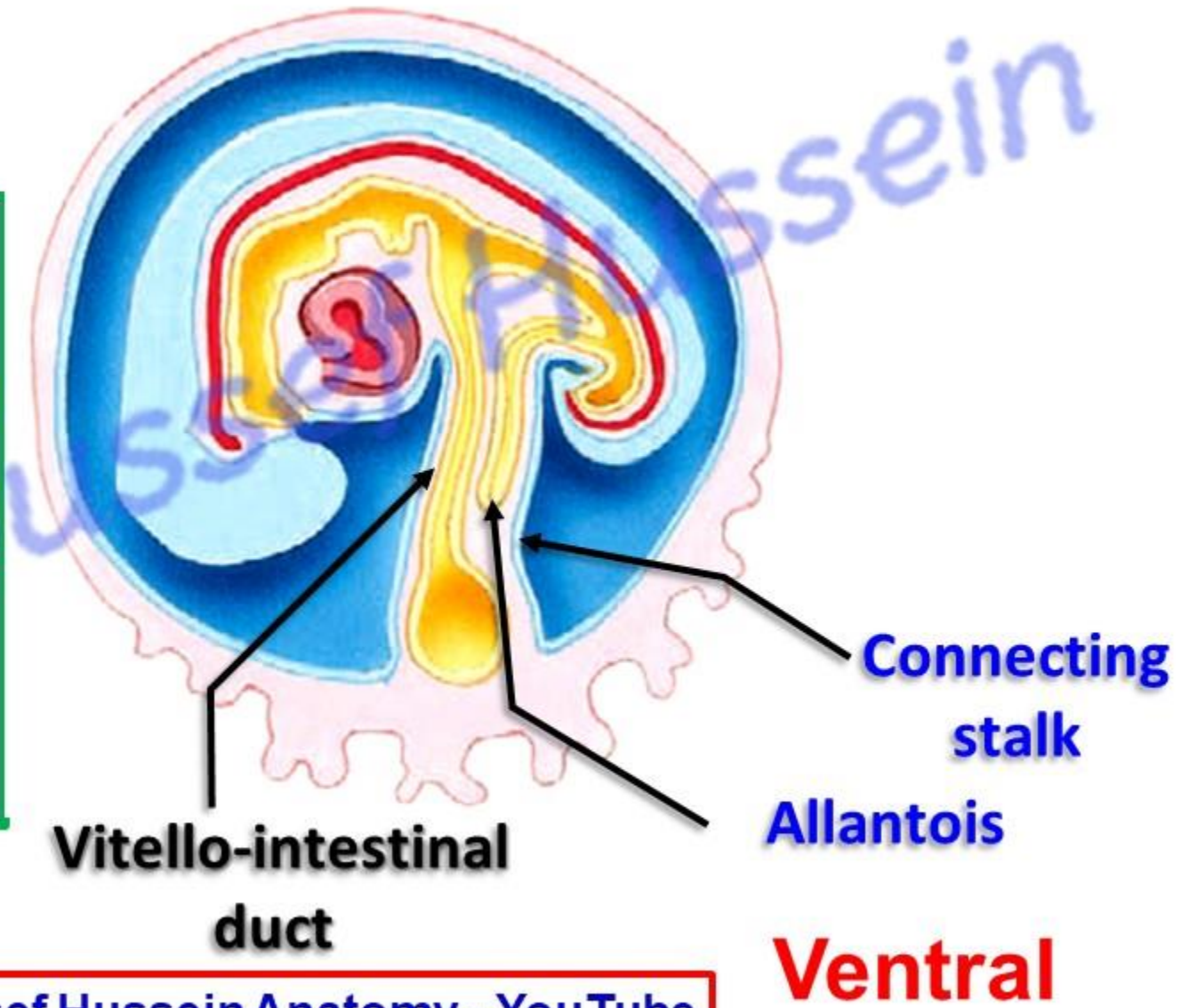
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- It is a cord-like structure connects the placenta (fetal surface) with the umbilicus of the fetus



** Formation of the primitive umbilical cord

- As the results of the tail folding, The connecting stalk (**Future umbilical cord**) becomes ventral to embryo and containing **Allantois** and **Vitellointestinal duct**



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** Formation of the primitive umbilical cord

1- Vitello-intestinal duct (VID) between midgut and definitive yolk sac and surrounded by 2 vitelline arteries and 2 vitelline veins.

2- Loops of intestine (physiological hernia) in the *extra-embryonic coelom*.

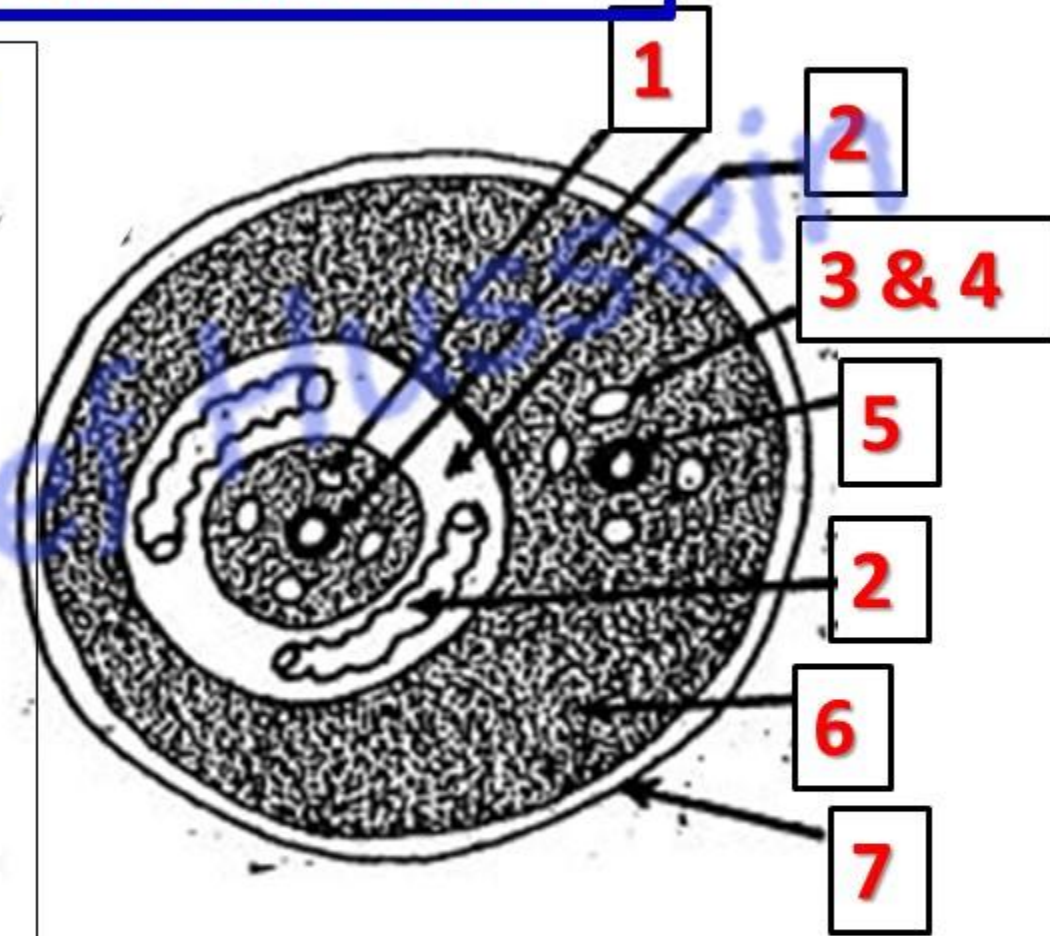
3- 2 umbilical arteries carry **non-oxygenated** blood from the fetus to the mother.

4- 2 umbilical veins carry **oxygenated** blood to the fetus.

5- Allantois (urachus) small diverticulum from cloaca and extends into the connecting stalk.
- It connects the apex of the urinary bladder with the umbilicus.

6- Extra-embryonic mesoderm.

7- It is covered by amniotic membrane.



Definitive of Umbilical Cord

Remnant of allantois

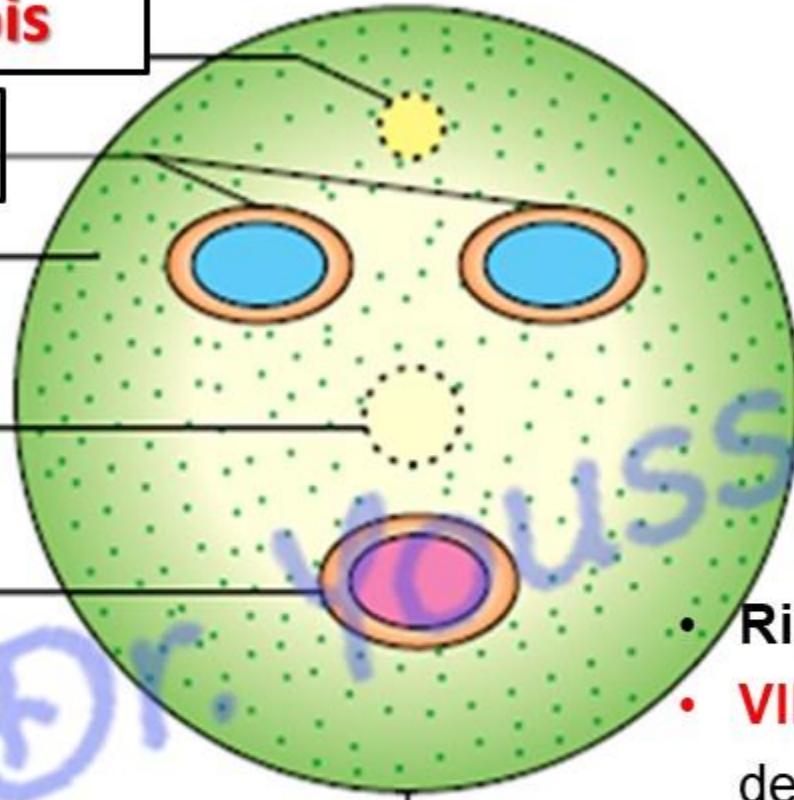
2 Umbilical arteries

Wharton's jelly

Remnant of VID

Left Umbilical vein

Amnion



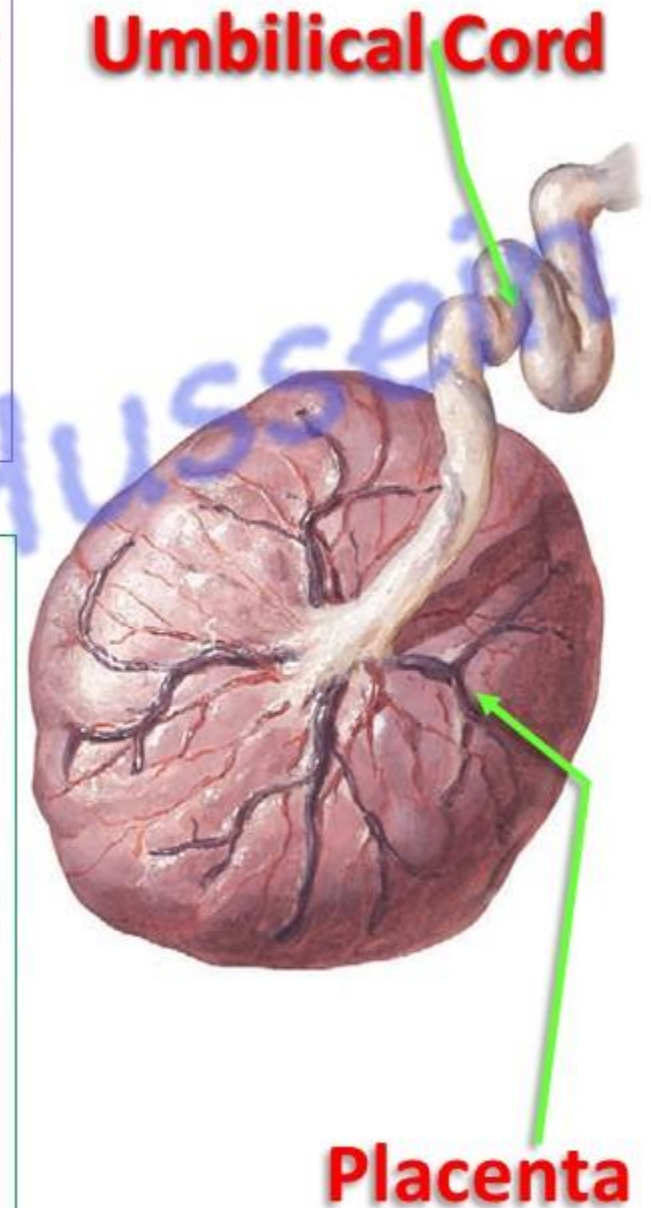
- **2 umbilical arteries** (Right & Left).
- **Left umbilical vein.**
- These structures are embedded in a jelly like material called **Wharton's jelly.**
- It is covered by **amniotic membrane.**

- **Right umbilical vein** is obliterated.
- **VID and vitelline vessels** obliterated and degenerated.
- **Allantois (urachus)** obliterated and forms **median umbilical ligament** of urinary bladder.
- **Loops of intestine** return to abdominal cavity.
- **Extra-embryonic coelom** is closed.

- The umbilical cord has natural twists (false knotting) because umbilical vein is longer than umbilical arteries
- At Full-term Length: 50–55 cm.
Breadth: 1–2 cm

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- Changes of umbilical cord after labor
- Left umbilical vein is obliterated and forms ligamentum teres of the liver.
- 2 umbilical arteries are obliterated and form 2 medial umbilical ligaments of the urinary bladder.
- Allantois is obliterated and forms median umbilical ligament of the urinary bladder
- VID is obliterated and degenerated



- **Congenital anomalies of the umbilical cord**

1) **Very long cord:** more than one meter.

- It may surround the neck of the fetus leading to death.
- It may turn around limb of the fetus leading to its atrophy.
- Cord prolapse in the vagina during childbirth

2) **Very short cord:** less than 30 cm.

- It limits the movement of the fetus.
- It leads to early separation of the placenta leading to bleeding.

3) **Congenital umbilical hernia:** failure of reduction of the intestine.

4) **True Knotting of the cord:** leading to interfere with the blood supply of the fetus.

5) **Double or triple cord.**

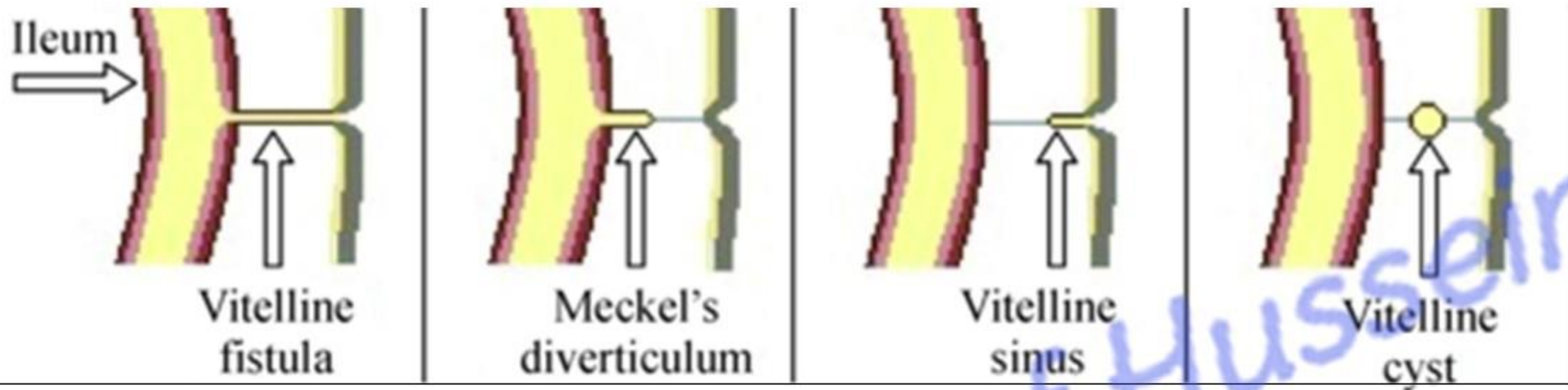
6) Anomalies in the attachment of the cord:

- a- **Battledore** **هامشية** **placenta**, attached to the **margin** of the placenta.
- b- **Velamentous** **غلافي** **placenta**, attached to the fetal membranes.

7) Anomalies in the allantois (urachus):

- a- **Urachal fistula**: persistence of the urachus. It leads to discharge of urine from the umbilicus of the fetus.
- b **Urachal cyst**: persistence of the **middle** part.
- c- **Urachal sinus**: persistence of the **distal** end.

7) Anomalies in the vitellointestinal duct (SEE yolk sac)



**** Congenital anomalies of Vitellointestinal duct:**

- i) **Vitelline fistula (patent VID):** persistence of the duct leading to discharge of the intestinal contents through the umbilicus.
- ii) **Meckel's diverticulum,** persistence of the **proximal** end of the duct.
- iii) **Vitelline sinus:** persistence of **distal** end of the duct leading to discharge mucus from the umbilicus.
- iv) **Vitelline cyst:** persistence of the **middle** part of the duct.
- v) **Fibrous band,** The duct completely fibrosed and persistence leading to Volvulus and intestinal obstruction.

https://www.youtube.com/channel/UCVSNqbibj9UWYaJdd_cn0PQ

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Thank You
Questions

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